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6. Jottings in the Cucurbitas

by L. H. Bailey

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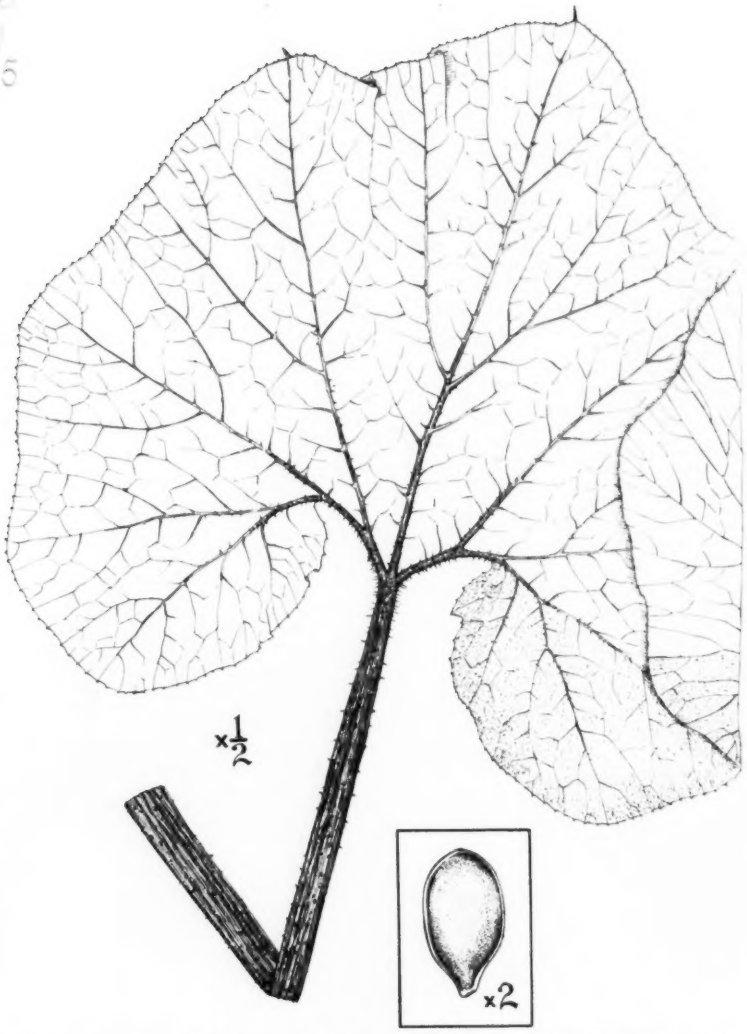


211. CUCURBITA ANDREANA, mature leaf and seed, grown in the United States from Argentinian seeds.

ARTICLE 6.
JOTTINGS IN THE CUCURBITAS.

Again I come with a packet of Cucurbita studies, after more than seventy years of growing them in wonder and fascination, and in the effort to find out what they are. This statement will surprise the casual reader because he knows they are pumpkins, squashes, gourds, cymlings, and others of their kinds, and all the cooks and cattle feeders are well aware and have no questions to ask. The botanist knows them traditionally as *Cucurbita Pepo, C. maxima, C. moschata*, three hearty species-names that have come down to us for more than one hundred and fifty years. Yet these names may not represent real species, as we like to understand that term in these later technical days, and we are not arrived at the point where the perplexities can be resolved. These three multiplicities are entities, however, and they do not regularly cross or hybridize in nature and the three lines hold their identities through generations of inquisitive humans. Chromosomes in each of them are recorded as 20 pairs. It was once assumed that these three and other related species were Asian because that geographical term was sufficiently vague to cover all doubts and to satisfy. But we now find that there are truly wild and native Cucurbitas original in the occident, and none of the others is known to be indigenous elsewhere. We conclude that the genus Cucurbita is peculiar to the western hemisphere, and such history of the fruits as we possess confirms this conviction. (See Thos. W. Whitaker, Ann. Mo. Bot. Gard. xxxiv, 102, 1947). Yet we have not been able to find the few old species in a truly original state.

Two lines of effort attach themselves to the study of Cucurbitas. One is the archeological, as a contribution to the study of the tribes of men, their wanderings and their cultures, inasmuch as seeds, peduncles and pieces of rinds, as well as early pictographs and utensils, are found in the remains. Effort to identify these artifacts is somewhat satisfactory but not conclusive. The other effort is botanical or more properly taxonomic, whereby identities are determined and the knowledge is published in clear diagnosis. A third line of effort may be mentioned, in the interest that pertains to such fruits of them as are durable and known as gourds, useable in decoration and as ornaments and for the understanding of which Gourd Societies are organized. My interest is primarily botanical, and to

this end I have grown the plants profusely; I have never overcome m amazement that such things can be, and the puzzles of identity increa with every new experiment.

Unaccountable results accrue from careful crossings: note the det of my experiments in 1887–1890 in Gentes Herbarum, ii, pages 67–7 published in the year 1929. From one crossed fruit 110 kinds of pepos we produced, most of them wholly unlike either ancestor and all of them n to be anticipated as offspring of the chosen parents, although within th botanical limits of *Cucurbita Pepo*. "I became convinced that the produc tion of good new varieties was not by means of hybridization" (page 73). I have hybridized plants in many genera but only in Cucurbita am I unable to predict the probable progeny.

A seed is placed in the ground on the thirtieth day of May. Soon a white looped stem appears and pulls its head out of the ground backwards. Two big flat green cotyledons entend themselves to the sun. Then leaves of another kind come forth, stems elongate and flatten themselves on the ground, tendrils reach for weed and bush and fence, soon the neighborhood is covered with overlapping large leaves, all the growth of a lush and almost succulent nature and the area is buried. In late July great bell-like yellow and golden temporary flowers open to the morning sun and are filled with bees, so temporary that they are collapsed by noon. Center of the flower is a straight column of three conjoined stamens profligate with pollen, and in another flower is the lobed head of three conjoined waiting pistils based in a fleshy rim or cup inside the soft resplendent corolla. Then the fruits appear, and one never knows what they will be; here is the crown of the mystery, and no one has yet found the reason for the surprising differences in these great fruits that in three or four months have come forth in a soil strange to them. Frosts of September and October finish the plants forever. Only the squash-vine borer carries the memory over winter, and in the next early summer the wasp-like attractive moth looks for a place to lay her eggs and thereby to continue the succession of insects even though the succession of plants is ended. It is a quick and urgent spectacle. I am conscious that I grow miracles.

Botanical sequence

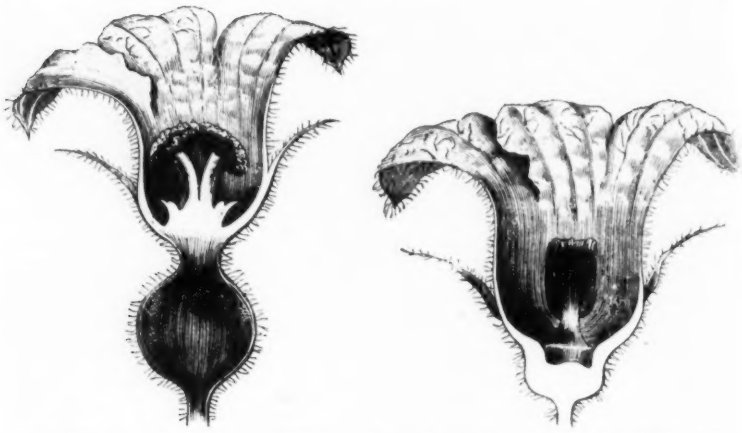
Botanical nomenclature of the Cucurbitas begins, of course, with Linnæus in 1753 in Species Plantarum where five species are described, one of them now separated as Lagenaria and one other as Citrullus. The three true Cucurbitas are *C. Pepo*, *C. verrucosa*, *C. Melopepo*, all of them now commonly covered in *C. Pepo* as fruit forms. Linnæus did not describe the three species, but named them from entries in literature. His herbarium does not have specimens of them, if we withhold one sheet with

note on *verso*, "Pepo fructo clypeato" (or shield-shaped). His *C. Pepo* he apparently named from an entry in Caspar Bauhin's Pinax, published at Basil, Switzerland, in 1623, and there is no direct evidence that Linnæus ever saw the plant. Sixty years ago I went over the Bauhin collections in Switzerland and found no *C. Pepo*, and a recent search by the authorities in that place confirms the absence. In 1767, in the Mantissa, Linnæus founded *C. ovifera* and a specimen is in his herbarium; this is a yellow-flowered gourd, now included in *C. Pepo*.

The real beginning of Cucurbita taxonomy is in Lamarck Encyclopédie Méthodique, volume ii, Paris 1786. The introductory statement says that for several years M. Duchesne had grown plants of the genus with a view of checking the effect of cross-fertilization among the different species, and that he had colored drawings prepared of the results. These drawings, to illustrate a very detailed memoir of his work, were given in 1779 to the Royal Academy of Sciences, having been previously presented to Louis XV at Trianon; they were deposited in the Cabinet des Estampes of the Bibliothèque du Roi. In the hope that these historic water-colors might throw new light on the confused taxonomy of Cucurbita in the Encyclopédie I applied to Mons. H. Humbert of the Muséum National d'histoire Naturelle in Paris as to the present availability of them. Professor Humbert replied in 1946 that the Duchesne drawings in the Cabinet des Estampes bear no inscriptions and only consecutive numbers not corresponding with anything in the literary treatment and that nothing can be found of any catalogue or memoir of the collection and adds his fear that the pictures must be considered worthless from the point of view of types. The paintings number 361, of which nearly 200 bear numbers. I made arrangements to have photographs taken of these nearly 200, and the films with prints are now the property of the Hortorium. I have not been able to elucidate the Duchesne taxonomy by the use of these interesting pictures although they depict the kinds of fruits known in France at that period. The pictures are almost wholly of fruits, without foliage, flowers or seeds; and we have learned that pepos alone are not sufficient for close identification of the species in Cucurbita.

Subsequent judgments of Poiret, Seringe, Roemer, Gasparrini, Naudin, Alefeld, Cogniaux, and others have established the species of commonly cultivated Cucurbitas as *C. Pepo*, *C. maxima*, *C. moschata*, and there is probably no profit in efforts radically to modify these categories as to binomials and diagnoses. In the meantime, however, we may take note of some recent contributions.

Latin binomials applied to variants in the cultivated Cucurbitas through the years are numerous, many of them on shape and size and markings of pepos without close account of foliage and flowers and armature and



212. CUCURBITA ANDREANA, pistillate and staminate flower, in longitudinal section, natural size. Reproduced from the original account in Revue Horticole, 1896.

therefore can hardly be made the bases of modern nomenclature; they may be allowed to rest. Similarly, the nomenclature of plants with which genetic studies are undertaken must be verified by good botanical specimens, if the work is to have scientific value; not anything must be taken for granted.

Vernacular names of Cucurbitas I have grown recently from Latin American seeds are as follows:

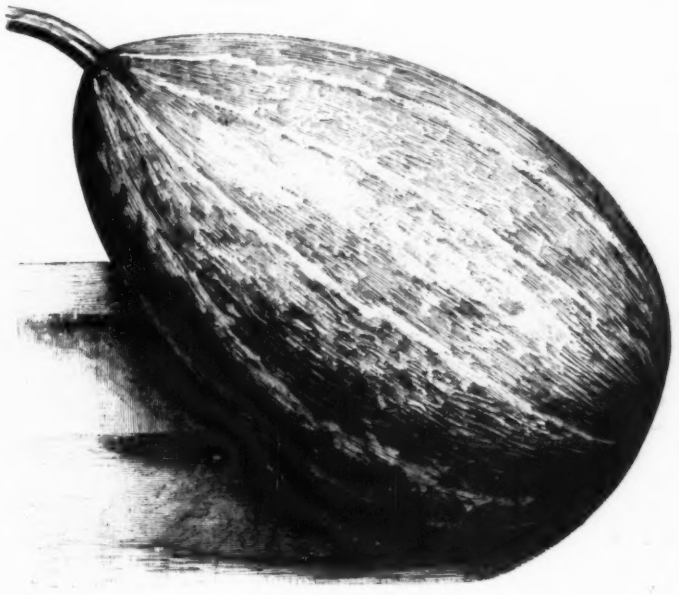
C. Pepo—from Bolivia: Escariote, Escarolle; from Mexico: Calabaza de Agua, Cal. de Muerta, Cal. Sihuina, Cal. de Castilla, Cal. de la Tierre, Cal. Corriente, Cal. de Arbol, Cal. Castillona, Squash Guayeca.

C. maxima—from Bolivia: Zapallo.

C. moschata—from Mexico: Calabaza India, Cal. Chompa, Cal. Guayteca, Cal. Guaje, Cal. Temalayote, Cal. de Castilla; Cuisayote; Tamala; Pachona.

213. CUCURBITA ANDREANA, young fruit, natural size. Revue Horticole, 1896.

I have mentioned the squash-vine borer. It has lately been a serious menace at Ithaca. I have noted that not all vines are seriously infected, and I have watched the industrious active moth laying her eggs and thought she avoided certain plants and that the immunities followed species-lines in Cucurbita. I therefore suggested to Dr. L. A. Carruth, enmtoologist working on cucurbit insects at the New York Agricultural Experiment Station at Geneva, to give attention to the situation. Preliminary report of himself and his associate, Wayne L. Howe, shows that the moth exercises discrimination amongst cucurbits in laying her eggs, although apparently none of the species is wholly immune. The varieties of *Cucurbita maxima* are conspicuously injured, and those of *C. moschata* are relatively free from attack; egg-laying on stems of this latter species does not always result in injury for the young larvæ may not be able to penetrate the tissues. The relative immunity or injury is apparently associated with the hard woody or the soft spongy structure of the stem tissue, but how does the moth know which vines to choose and to avoid? In late years I have made pressed specimens of the full-grown roots of Cucurbita,s splitting the thick parts and mounting them on the sheets. There are



214. Cucurbita Andreana, full-grown fruit, natural size. Revue Horticole, 1896.

undoubtedly good specific characters in the roots, and I suggest that they be given attention by future taxonomists.

Cucurbita Andreana, Naudin, in Rev. Hort. lxviii, 542 (1896). Figs. 211–219.

Strong short-jointed very leafy annual vine, axes not spiculate but loosely pilose with very thin translucent hairs; tendrils pedunculate, 4–6-parted, pilose: leaves rotund-reniform, at full size about 24 cm. across and 20 cm. long, but prevailing foliage perhaps one-half these dimensions, with uniform undulate closely serrate margins but not lobed, sometimes maculate, sparsely and minutely spiculate on both surfaces and variously pubescent when young, apex of each undulation bearing a brief cusp, base deeply and mostly narrowly cordate and the well-pressed mature leaf showing a sinus characteristically recessed at top (as in Fig. 215); petiole conspicuously scarious with bulbose spiculæ and often very pilose toward the top: flowers typically urn-shaped and profusely pilose with thin translucent hairs as is the peduncle, tube cylindric and longer than the more or less spreading obtuse but apiculate corolla-lobes, varying to campanulate or even broader and with reflexed lobes; staminate flower 6 cm. long and tube 2 cm. plus broad, the very narrow calyx-lobes about one-half length of tube and prominently pilose, these dimensions greater in forms with larger and less cylindric corollas; pistillate flower 7–8 cm. long with ovary and tube 3 cm. plus broad, limb about 6 cm. broad, corolla sometimes broader and longer, all parts including slender calyx-lobes prominently pilose: pepo oblong-pyriform to oblong to almost globular, gourd-like, pilose when young but becoming glabrous, 8–16 cm. long (to 20 cm. in original publication), green with whitish irregular stripes and spots, apical scar very small, shell hard and durable, flesh stringy and bitter; peduncle 7–9 cm. long, somewhat striate, slender, spiculate, not enlarged at attachment; seeds whitish, small, 7–8 mm. long, ovate, narrowed to point, usually without markings but sometimes larger and reticulate without color.

Extra-tropical South America, in Uruguay and Argentina, known as *Zapallito amargo* or bitter gourd. I have had seeds of it in several collections from Dr. Roberto Millan, Director Estación Experimental Nacional de Balcarce, Argentina. Plants have been grown to maturity at Ithaca, New York, by Dr. Erdman West at the University of Florida, Gainesville, and by Thomas W. Whitaker, La Jolla, California, and I have 115 sheets of specimens and photographs in the herbarium.

A fruit had arrived in France from Uruguay and plants were grown there, having been sent by Edouard André, editor of Revue Horticole, and the species was described by Naudin in that journal in 1896, with pictures of a pistillate and staminate flower, young fruit, mature fruit, all of which are reproduced full size in Figs. 212–214. Leaves have not been illustrated, as far as I know, until the present paper, Figs. 211, 215.

I have found variation in flowers, fruits and seeds of *C. Andreana*, but

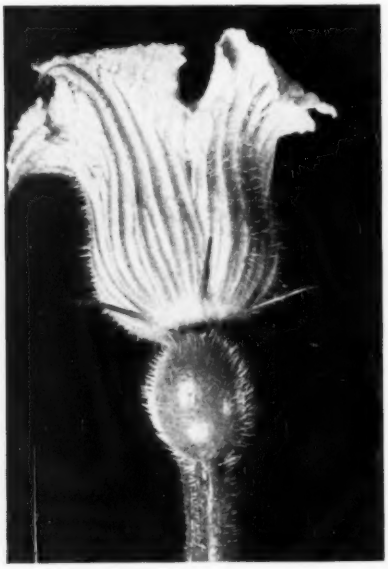
215. CUCURBITA ANDREANA foliage, at Ithaca, New York.

216. CUCURBITA ANDREANA, staminate flowers, grown at Ithaca, New York; three-fourths natural size.

apparently no greater than one would expect in a Cucurbita. The roots are thick and strongly branching, not tuberous, and some of them are attacked by the squash-vine borer.

The particular marks of *C. Andreana* are the rotund reniform unlobed leaves with very close serrations and deep narrow basal sinus with cornered expansion at apex, lack of definite straight pricklets, strikingly hairy flowers and young fruits, long slender hard angled peduncle not expanded at end.

Recently Roberto Millan has suggested (Revista Argentina de Agronomía, xii, 86–93, June, 1945) that *Cucurbita Andreana* is the original species of the cultivated *C. maxima*. The foliage of the two species is similar and the hairiness of the flowers, but beyond these features it is difficult to accept this explanation. In my cultures of *C. Andreana* I have not seen suggestion of the great fleshy edible pepo with the large thick seeds. Yet the suggestion, based on field experience, must be entertained with great respect. I should desire to know, as a preliminary, whether the seeds from which the plants were grown had been crosses made by natural agencies, or whether, in fact, *C. maxima* itself is native in the region and has not been distinguished from *C. Andreana*. The fact that many plants of *C. Andreana* in my garden attract the borer lends plausibility to the suggestion, inasmuch as *C. maxima* is particularly subject to this injury. The origin of *C. maxima* has been a complete mystery. Careful studies of *C. Andreana* have been undertaken in Argentina. The first full botanical diagnosis of the species, as far as I know, is in the present paper. Naudin's account was not critical, and except for his pictures and the region from which it came, identification of the species would be impossible.

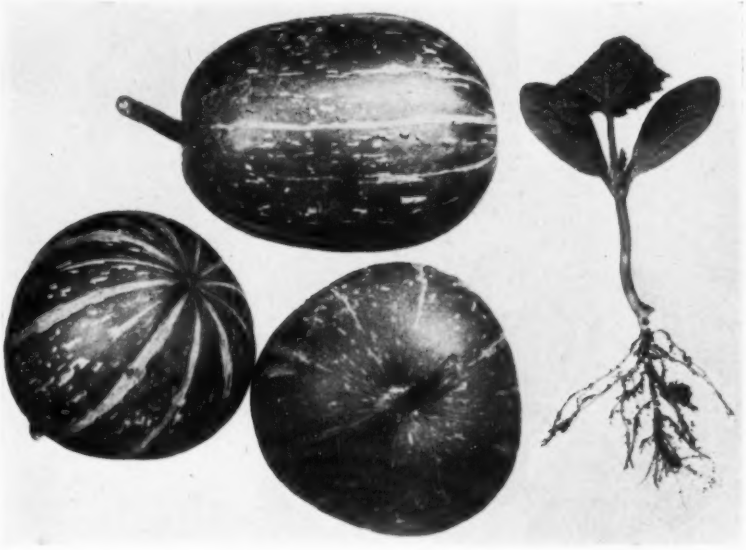


217. CUCURBITA ANDREANA, pistillate flower, natural size, as grown at Ithaca; often broader than this at full maturity.

Cucurbita argyrosperma, Hort. SILVERSEED GOURD. Figs. 220–222.

Caulis gracilis, tenuiter striatus, sine pilis, sine aciculis; viticulæ breves, 3–4-partitæ: folia late cordato-ovata vel cordato reniformia, irregularia sed non lobata, 20 cm. vel plus longa lataque, apex triangularis et pæne vel admodum obtusus, sinus basalis angustus, superficies scariosæ, margines irregulariter denticulati; petiolus scariosus spiculis bulbosis: flores flavi, viridistriati, lati lobi apiculati; flos staminatus 6 cm. longus, 7–8 cm. latus, lobi calycis 2–3 cm. longi, indentati apice; flos pistillatus 6 cm. longus a basi ovarii, 7–8 cm. latus, lobi calycis 1–3 cm. longi et valde angusti: fructus pyriformes regulares, 15–20 cm. longi et lati, albidi virgis viridibus; semen 3 cm. longum, 1.5–2 cm. latum, planum, elevato argenteo-livido, margine 4–5 mm. lato.

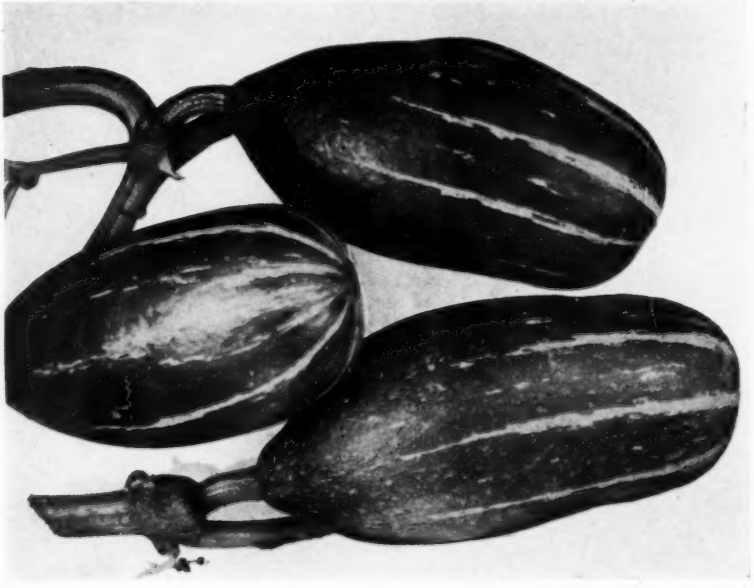
Annual, fruiting first year from seed, long-running, stem finely striate, devoid of hairs and pricklets and smooth to the finger; tendrils short, 3–4-parted: leaves broadly cordate-ovate or cordate-reniform, 20 cm. and more broad and of similar length from basal projections, irregular in outline but not distinctly lobed except at base, apex broadly triangular and obtuse or essentially so, base deeply cordate with narrow sinus, both surfaces scarious and lightly pubescent underneath when young, margins irregularly denticulate; petiole scarious with very brief bulbose-based spicules but not prickly: flowers with the yellow color of field pumpkin and of similar shape, conspicuously green-striate lengthwise, the broad lobes apiculate and spread-



218. CUCURBITA ANDREANA, grown at Ithaca; one-half natural size. At right, the two cotyledons; three-fourths natural size.

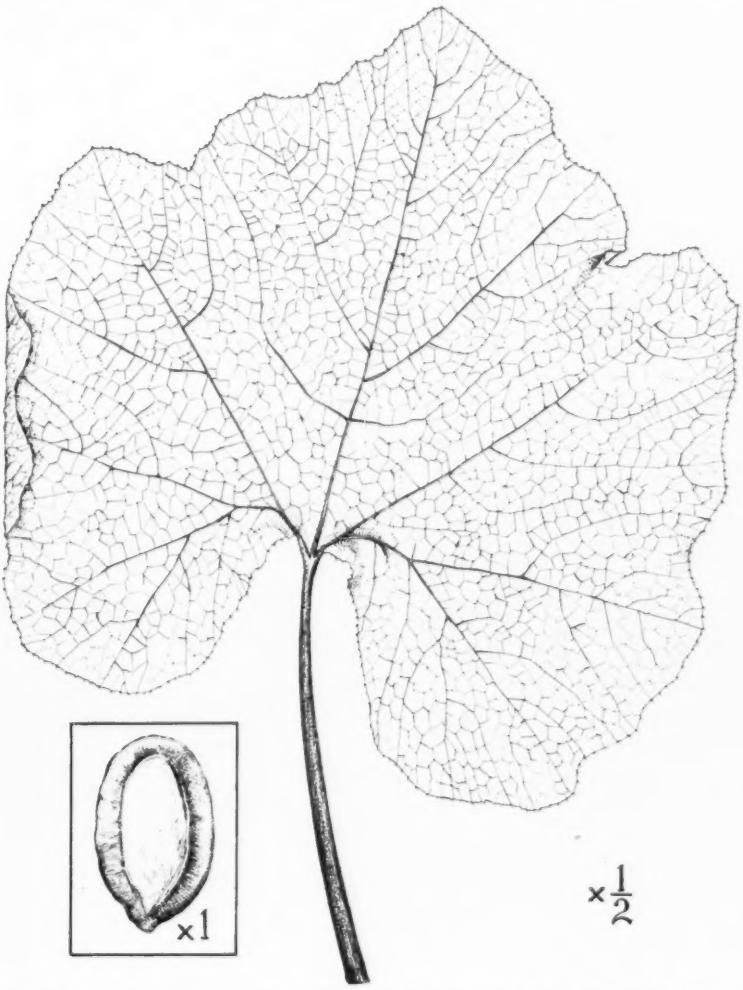
ing; staminate flower 6 cm. long, 7–8 cm. broad at expansion, calyx-lobes 2–3 cm. long, very narrow, obscurely indented toward end; pistillate flower 6 cm. long from base of ovary and 7–8 cm. broad, calyx-lobes 1–3 cm. long and very narrow: pepo ovoid to somewhat pyriform, regular in shape, 15–20 cm. long and broad, clear cinereous to whitish with many irregular green lengthwise bands and blotches, shell hard and durable, peduncle 7–10 cm. long, deeply angled, ribs expanded at attachment to fruit, flesh of fruit thin and stringy; mature ripe seeds very large, 3 cm. long, thin and flat, about 1.5–2 cm. broad, with a raised silver-bluish margin 4–5 mm. broad strongly contrasting with the white middle, margins obtuse unless chipped from handling when dry.

Probably Mexico and southward, for I have grown the plant from unnamed Mexican seed although perhaps it was not feral; and I assume it to be the plant intended by Pangalo as *Cucurbita mixta* var. *cyanoperizona*, "cultivated in Guatemala" (page 477). Somewhat cultivated in the United States for ornament from seed obtained of European dealers. I have raised it to maturity at Ithaca, New York, from European seed, an attractive vine. I have been unable to trace the name *argyrosperma;* I used it for a brief comment in my "Garden of Gourds," page 72 (1937); the name is



219. CUCURBITA ANDREANA, another form of fruit grown at Ithaca; about one-half full size.

not mine but in the seed trade and therefore I designate it as *Hort.*, hoping that the original authorship may disclose itself. At the time of that writing I had not seen the plant growing and I surmised it to be a variant of *C. ficifolia*, but now that I have raised it I can no longer hold to that



220. CUCURBITA ARGYROSPERMA as grown in New Jersey by Dr. George L. Fischer; one-half full size. Seed full size, showing the elevated silvery margin.

opinion; its affinity is with *C. moschata*, although the plant lacks the hairiness of that species.

Cucurbita ficifolia, Bouché, in Verh. Ver. des Gartenb., Berlin, xii, 205 (1837). FIGLEAF GOURD. Figs. 223–225.

C. melanosperma, A.Br. Cat. Hort. Karls. 1824, *nomen nudum*; Gaspar. in Act. Acad. Napol. (1847), and Ann. Sci. Nat. ser. iii, ix, 208 (1848).

Pepo malabaricus, Sageret, in Ann. Sci. Nat. Bot. ser. i, viii, 294–314 (1826), *nomen dubium*.

Pepo ficifolia, Britt., Sci. Surv. Porto Rico and Virgin Isls. (N. Y. Acad. Sci.), vi, 266 (1925).

Rampant scarious or roughish tendrillous vine, branching and attaining to hundreds of feet of slender axes which are not spiculate: leaves ovate-reniform in outline, to 25 or 30 cm. broad, deeply cordate with incurved lobes at base, prominently side-lobed with obtuse sinuses, lobes very obtuse or rounded, margins entire or only obscurely denticulate, surfaces sparsely short-pilose, blade having the aspect of a ficus or fig leaf, whence *ficifolia*: flowers campanulate or broader, yellow to light orange, green-striped lengthwise, tube short and flaring, corolla-lobes blunt or nearly so; staminate flower 6–7 cm. long, somewhat broader at expansion, calyx-lobes very short, narrow and spreading; pistillate flower 10–12 cm. long including the oblong thinly pilose ovary, 8–12 cm. broad at expansion and lobes ruffled and involute on margins, calyx-lobes short, narrow, spreading or reflexed, corolla disk of pistillate flower deeply indented or lobed: pepo oblong to

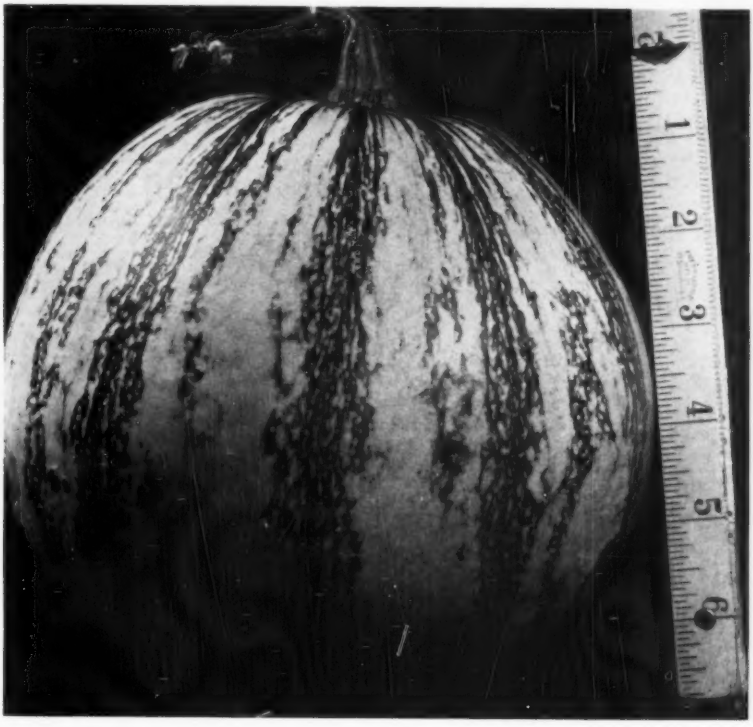
221. CUCURBITA ARGYROSPERMA, pistillate and staminate flower, grown at Ithaca, New York; about three-fourths full size.

obscurely pyriform to nearly globular, 10–15 cm. long, green with white stripes and markings, shell hard and durable, flesh white; peduncle medium in length, 5–6 cm. long, angled, somewhat expanded at attachment; mature seeds black or brown-black, ovate, flat, variable in size, 2 cm. or less long, about 1 cm. broad, margin conspicuous but thin and not elevated or fimbriate.

Probably original in Mexico and Central America and southwards, but formerly assigned indefinitely to oriental countries as testified by such names as Malabar, Angora and Siam gourds. I have grown it from commercial as well as Mexican seeds but the latter not known to be from the wild. Probably perennial, but grown as an annual in the North.

Whitaker, in his recent studies, concludes that *C. ficifolia* is New World in origin. Its chromosomes are 20 pairs.

Another black-seeded pepon is known in Latin America, passing

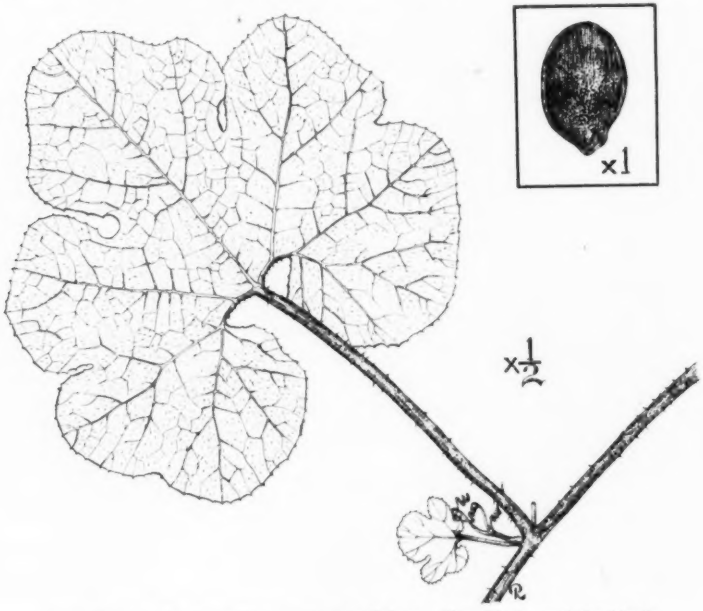


222. CUCURBITA ARGYROSPERMA, ripe pepo, white and green. Grown in New Jersey.

erroneously as *C. ficifolia*, grown by me from seeds received from Mexico, Colombia, Bolivia, Argentina. One correspondent states that the seeds may be either black or white in this plant, but even in true *C. ficifolia* and *C. argyrosperma* the seeds are white in the fruit until complete maturity and when apparently of full size. I have twelve covers of this black-seeded plant but have never been able to obtain fruit of it; awaiting that event I am holding these specimens under an unpublished binomial. It lacks the characteristic leaf lobing of *C. ficifolia* and the seeds do not correspond. My Mexican seeds of this strange plant come to me under the name Chilacayota (Jalisco), the Colombian as Vitoria, Bolivian as Lacayote, Argentinian as Cayote. Possibly this is the plant named in Dammann Catalogue, 1890–91 (Germany) as *Cucurbita mexicana* (Kew Bull. 1891, Append. 40), "very similar to *C. melanosperma*, but with the leaf of a difierent shape, and flower of a different hue, the seeds large and black."

†**Cucurbita Kellyana,** spec. nov. Figs. 226, 227.

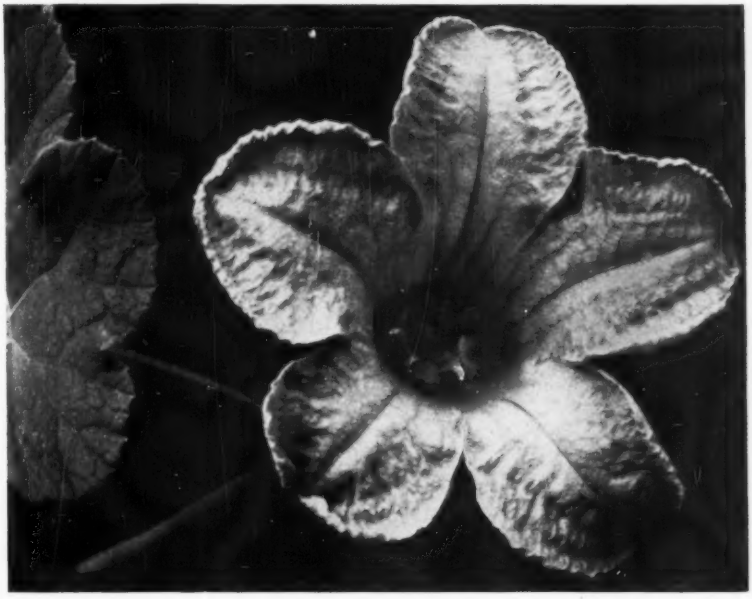
Annualis, longiscandens, caules striati, aciculis translucentibus 1–2 mm. longis: folia triangulariter cordato-ovata, 10–14 cm. longa et æque lata, 3-lobata vel interdum 5-lobata et sublobata, piloso-pubescentia, apices



223. CUCURBITA FICIFOLIA, grown at Ithaca, New York, and the black seed. Note the lobing of the leaf.

acuti, margines minute serrati: flores staminati tubulari-campanulati, striati, 6–9 cm. longi, 6–8 cm. lati, lobi corollæ acuto-ascendentes; flores pistillati etiam tubulari-campanulati, 8–9 cm. longi, striati, lobi calycis breves et valde angusti, 1–2 cm. longi: fructus oblongi vel obpyriformes, 8–9 cm. longi, virides et albo-virgati; pedunculus angulatus, expansus ubi adjunctus; semina 10–12 mm. longa, 6–7 mm. lata, alba vel glauca, ovata.

Annual as grown in United States, slender vine running several feet, stems striate, closely provided with slender little pricklets 1–2 mm. long that are rough to the finger; tendrils 4-partite, the two long branches perhaps 8 cm. long: leaves triangular cordate-ovate, grayish, pilose-pubescent on both surfaces, 10–14 cm. broad and of similar length, lobed on shoulders and blades, on young or new growths 5-lobed and sublobed, sinuses obtuse, all apices sharply pointed, margins very finely and closely serrate, deeply broadly cordate at base; petiole conspicuously pilose-pubescent, the translucent thin hairs 2–3 mm. long: staminate flowers tubular-campanulate, striate, 6–9 cm. long, limb ascending or flaring with acute lobes and 6–8 cm. broad, calyx-lobes very narrow, usually 2 cm. or less long, sometimes almost thread-like; pistillate flowers also small and narrow-campanulate, 8–9 cm. long with ovary, and nearly as broad at expanded limb, striate lobes acute, calyx-lobes inconspicuous and short, sometimes less than 1 cm. long, very narrow: pepo gourd-like with hard thin durable shell, oblong to



224. PISTILLATE FLOWER, about three-fourths natural size, of *Cucurbita ficifolia*. Note the indented internal disk.

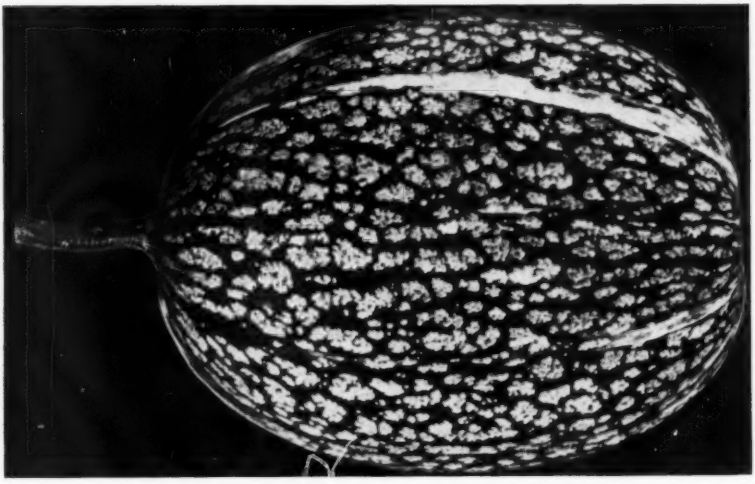
indifferently obpyriform, 8–9 cm. long, green with longitudinal whitish stripes and irregular spots, eye or apical scar little elevated and 5–6 mm. across; peduncle slender and hard, bristly, mostly curved, lightly furrowed, somewhat angularly expanded at attachment to fruit, 4–5 cm. long, flesh stringy and bitter; seeds ovate, at full maturity gray or drab to nearly white, 1 cm. or a little more long and 6–7 mm. broad, without markings, margins not conspicuously elevated, variable in size.

Mexico: grown from seeds taken in the wild in Jalisco at Tolonchi, Chachahuatlan en Tuxcacuesco; seeds toasted for pipian. I have grown it also from elsewhere, region not stated on seed packets sent me by traveller. Named for Dr. Isabel Kelly, ethnologist of experience in Mexico.

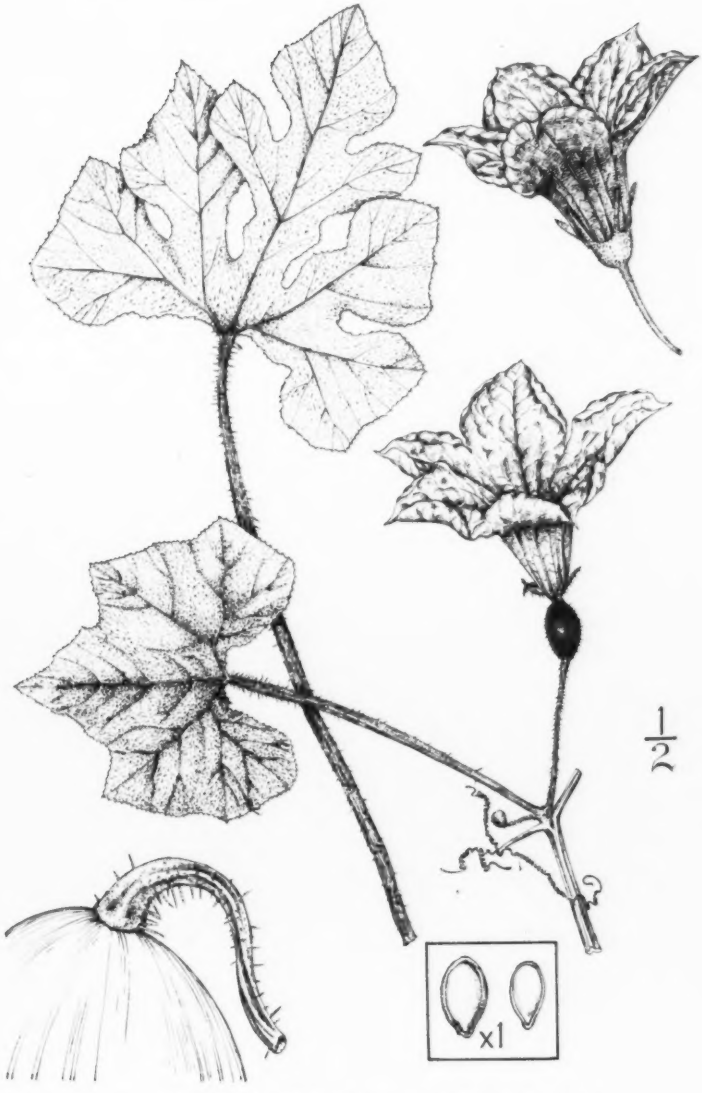
This plant suggests *Cucurbita texana* but that species has leaves prevailingly deeply lobed with obtuse sinuses as seen in my last cucurbit paper (Fig. 140 in Fasc. v, Gent. Herb. vi, 1943), whereas in *C. Kellyana* the deep lobing is exceptional and of a different pattern, and the ranges of the two species are unlike, *C. texana* being northern and not yet positively known from Mexico. Leaves of *C. Kellyana* are more triangular, upper surface more scarious, basal sinus broader, margins with different serration, stems or axes less spiculate, petioles more pilose, pepo less often pyriform.

†**Cucurbita Moorei,** spec. nov. Figs. 228, 229.

Caulis gracilis, striatus, inermis: folia reniformia, 8–10 cm. lata, sparse piloso-pubescentia, maculata supra, 5-lobata pæne ad basin, lobi obtusi sed



225. GREEN-AND-WHITE FRUIT of *Cucurbita ficifolia*, about three-fourths natural size.



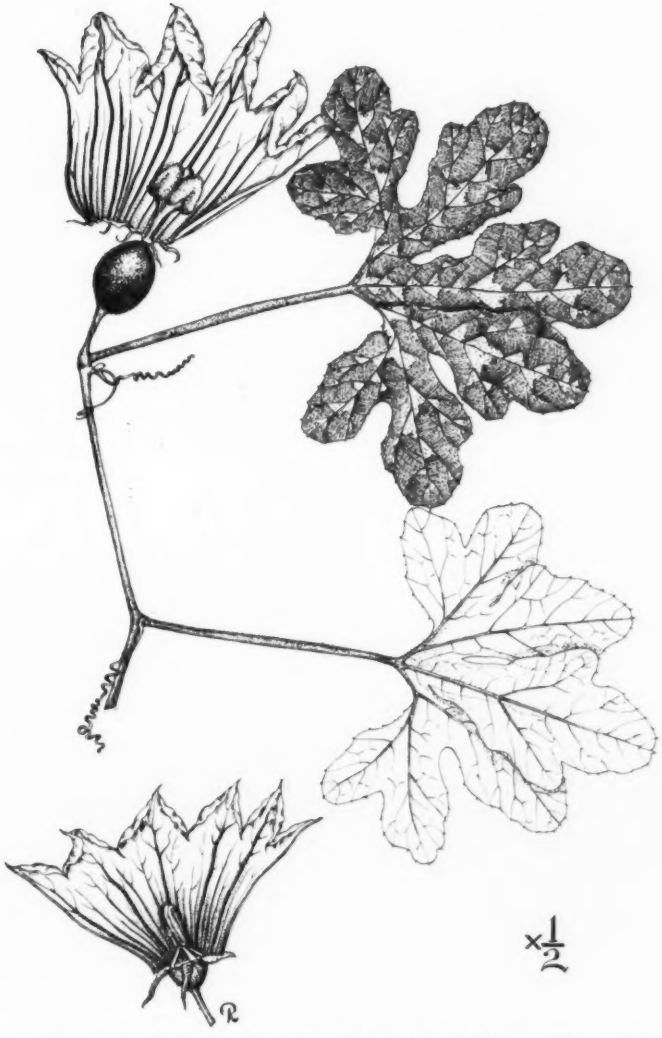
226. CUCURBITA KELLYANA ♂ Mexico, grown at Ithaca, New York.

acumine brevi, margines integri vel parvis serraturis sparsis; petiolus 4–6 cm. longus, minute pilosus sed non spiculatus: flores aurei, conspicue virgati, lobi acuti; flos staminatus 6–8 cm. longus, tubulo lato, lobi calycis 1–2 cm. longi et valde angusti; flos pistillatus 10 cm. longus cum ovario, valde latus, lobi calycis circa 1 cm. longi, parvi: fructus oblongo-globulares, 7–8 cm. longi, 6–7 cm. lati, fusco-virides irregularibus albis marginibus; pedunculus striatus, scariosus, expansus apice; semina albida, 10–12 mm. longa, 5–6 mm. lata, colore uniformi.

Short-jointed leafy vine with slender unarmed striate stem: leaves reniform in outline, 8–10 cm. broad, 5-lobed nearly to base, lateral lobes again lobed, thinly pilose-pubescent, blade with white blotches on upper surface, sinuses narrow and mostly obtuse, lobes obtuse but with brief cusp at apex, margins entire or with very small scattered serratures; petiole 4–6 cm. long, minutely and thinly pilose, not spiculate: flowers orange, boldly striped and laterally veined from the main central stripe, lobes acute at apex; staminate flower 6–8 cm. long with broad tube, calyx-lobes 1–2 cm. long, very narrow; pistillate flower 10 cm. long with ovary, very broad, calyx-lobes about 1 cm. long, very narrow: pepo oblong-globular, 7–8 cm. long and nearly as broad, gourd-like and inedible, dark green with whitish broken lengthwise bands and blotches, weight at maturity about 8 ounces; peduncle slender, striate, scarious, expanded at attachment; seeds whitish, 10–12 mm. long, 5–6 mm. broad, without markings.

Central Mexico: Ixmiquilpan district, Hidalgo, *H. E. Moore, Jr.* and

227. WHITE-STRIPED PEPOS of *Cucurbita Kellyana*, grown in California; about three-fourths full size.



228. CUCURBITA MOOREI, collected wild in State of Hidalgo, Mexico. Note the mottled or maculate leaf.

C. E. Wood, Jr., 3743, altitude about 1750 m., a vine on shrubs in roadside thicket; leaves with fetid odor when crushed. Root not known. Pringle number 9640½, from Hidalgo, is probably this species; lacking flower and fruit.

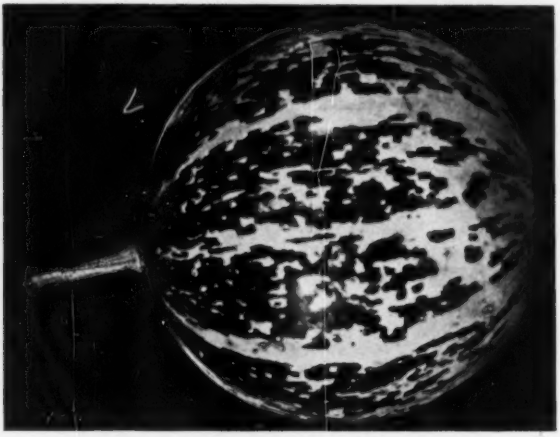
†**Cucurbita moschata** var. **melonæformis,** stat. nov. Figs. 230–237.

C. melonæformis, Carr. in Rev. Hort. liii, 137 (1880).

C. Pepo var. *melonæformis*, Makino, Obs. Fl. Jap. fasc. viii, 47 (from Tokyo Bot. Mag. xxii, 1908).

Mature prevailing leaves more rounded in outline and more closely serrate than in the usual forms of *C. moschata*, less prominently and less sharply lobed on shoulders, petiole commonly conspicuously shaggy-hairy toward apex, peduncle long and slender and deeply angled, up to 10–12 cm. long and usually curved and notably expanded at apex, pepo distinctly furrowed endwise or even lobulate, commonly flat at ends and much broader than long but frequently oblong, not streaked green-and-white nor pyriform, with a neck, apical scar small.

Carrière had this plant from Japan and contrasted it with the courges or cucurbits of Europe and Africa. He had furrowed fruits flattened endwise that resembled enormous cantaloupe melons; and thus he named it *melonæformis*. The botanical relationship is clearly with *C. moschata*, and only one manifestation of that complex. Leaves are often maculate, and calyx-lobes are prevailingly expanded and dentate toward the end (Fig.



229. GREEN-AND-WHITE-STRIPED PEPO of *Cucurbita Moorei*, from Mexico. Natural length, 3 inches.

237); color of pepo dark green and often spotted with whitish or yellowish but not striped light green-and-white as in many of the moschatas, surface often pruinose.

I have grown the *melonaæformis* variants from commercial French seeds and they are common in the American tropics. In 1948 I brought two of them to full fruit in Ithaca, seeds from Dr. Martin Cardenas, Cochabamba, Bolivia; these are Joko redondo and Joko largo, shown in Figs. 232–234. Some of them have been grown for me by Dr. Thomas W. Whitaker at the United States Horticultural Field Station, La Jolla, California.

This species, *Cucurbita moschata*, is probably the prevailing cucurbit cultivated in the warm parts of aboriginal America. A good account of the species is given by A. T. Erwin in Iowa State College Journal of Science, x, 213–221 (1936). He portrays the antiquity of its cultivation by aborigines, discloses that the assumed hybrid origin does not hold, gives detailed botanical characters, and states that the evidence "points rather definitely to the conclusion that *C. moschata* is an ancient American species."

The botanical characters that distinguish *C. moschata* from its congeners are unusually definite for this genus, so much so that the trained observer at once recognizes the differences when plants are growing in the field. It is known at a glance by the soft and hairy grayish aspect of the foliage, absence of stiff setæ, recurved tip of the growing vine, and then by the angled peduncle and expanded attachment to the pepo as well as by the fimbriated margin of the seed. This fimbriated or "hairy" margin appears to result from a break-up of the epidermis of the perimeter and in fresh seeds the exfoliation may not have taken place and in very old seeds the shredded margin may have disappeared.

230. CUCURBITA MELONÆFORMIS of Carrière, 1880, now adopted as *C. moschata* var. *melonæformis*.

Erwin comments on the appropriateness of the specific name: Duchesne "refers to the fruit as being esteemed when eaten raw in certain countries, and the selection of the term moschata on account of the musk-like odor." This "leads one to question whether or not he was confused

and perhaps had before him a specimen of a muskmelon rather than a pumpkin when completing his description of *C. moschata*."

†**Cucurbita maxima** var. **turgida,** var. nov. Figs. 238–239.

Semina permagna turgidaque, lucido-brunnea, 3 cm. longa, 14–16 mm. lata, 7–8 mm. crassa, acumen valde obliquum; margo albus, prominens sed non elevatus: folia fere magna et rotundata, obscure vel indifferenter lobata vel non lobata, margines fere stricte serrati; petiolus valde pilosus et interdum infirme setosus: pedunculus cylindratus, non sulcatus, non expansus apice, non elongatus.

Very strong long-running vine with long and prominent forked tendrils and thick mostly woody roots probably annual that are sometimes invaded by the squash-vine root-borer: known particularly by the large plump shining-brownish seeds that may be 3 cm. long, 1.5 cm. or more broad, tapered to a broad oblique apex at point of attachment, with raphe-like obtuse whitish perimeter, 7–8 mm. thick at the turgid center, embryo imbedded in thick white lining of the pergamentaceous shell or epidermis; axes nude or weakly spiculate but not scratchy to the hand, petioles pilose, with scattered very weak spiculæ particularly toward the top: leaves reniform to reniform-ovate, in typical forms with closely serrate margins, sometimes 8–10 dm. across, apex apiculate, in some cases lobed much as in *C. maxima* itself: flowers very large, of the *C. maxima* form: fruit various but with a short cylindric not angled peduncle that is not expanded at attachment; pepo greenish, about 5 dm. and more long, green to orange, somewhat furrowed lengthwise, ovoid in outline.

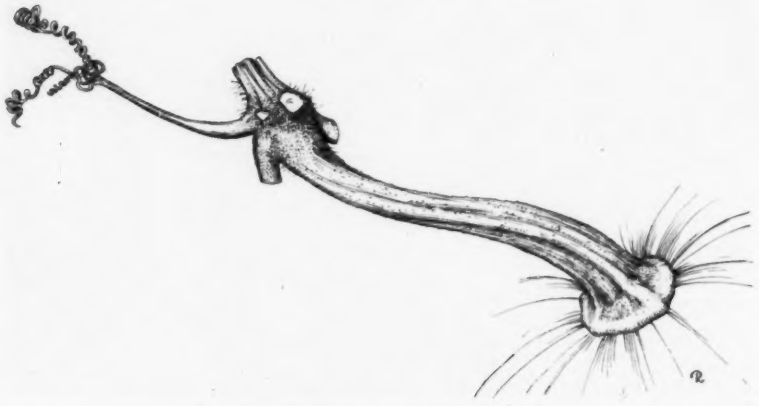
South America, known to me in six cultivated forms under the name Zapallo, seed supplied by Dr. Martin Cardenas, Cochabamba, Bolivia, as grown for food by the Indians of that country, and also by Indians of Cusco, Peru, at altitude of 3000 m.

231. Yokohama squash, grown and photographed in 1920, from French seed. *Cucurbita moschata* var. *melonæformis.*

232. JOKO REDONDO SQUASH, grown from Bolivian seed, by about one-third. *Cucurbita moschata* var. *melonæformis*. Dull green, flesh orange.

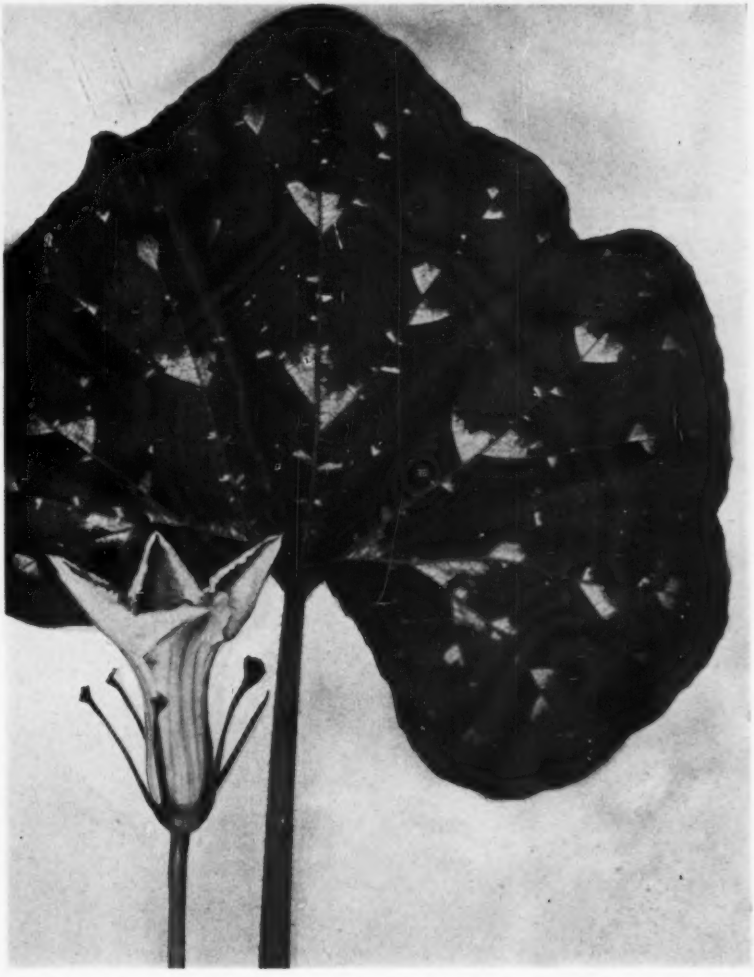
233. CROSS-SECTION AND LONG-SECTION of Joko redondo squash. *C. moschata* var. *melonæformis*.

234. JOKO LARGO SQUASH, grown at Ithaca from Bolivian seed, about one-third natural size. *C. moschata* var. *melonæformis*. Dull green.



235. ANGULAR FURROWED PEDUNCLE of *C. moschata* var. *melonæformis*, × ½. Note the expanded attachment to fruit.

For my understanding of *Cucurbita maxima* the reader may refer to Gentes Herbarum, ii, 99–103 (1929). More recently Professor A. T. Erwin has discussed the nativity of the species in Iowa State College Journal of Science, x, 441–445 (1936), who comes to negative conclusions on evidences



236. LEAF AND STAMINATE FLOWER, × ½, of *Cucurbita moschata* var. *melonæformis*; grown at Ithaca, New York.

of the indigenous place so far presented. Origin of this important specific unity is yet unsolved unless we accept the interesting suggestion of Roberto Millan (on page 456).

Three new botanical varieties of *Cucurbita maxima* are recently described by Millan, in cultivation in Argentina, not known to me in North America:

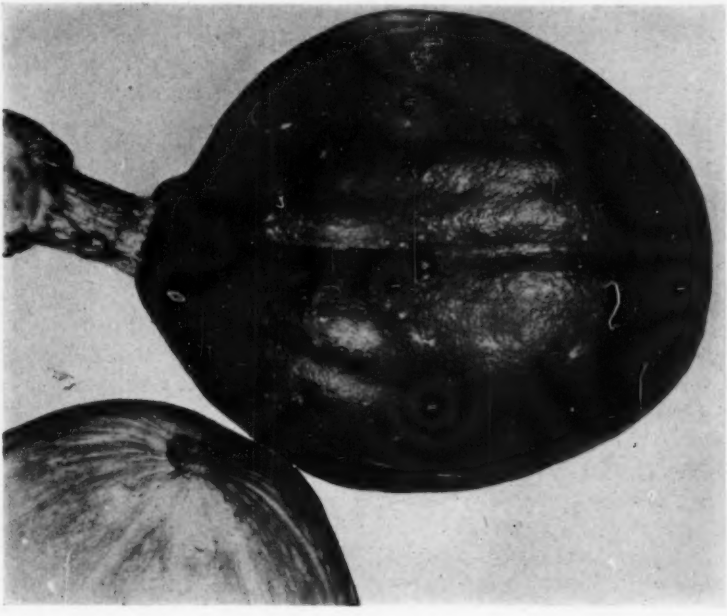
C. maxima var. **Zapillito,** Millan, in Darwiniana, vii, 334 (1947). ZAPALLITO DE TRONCO.

C. Rapillito, Carr. in Rev. Hort. xliv, 399 (1872), corrected by Carrière, op. cit. xlv, 90 (1873).

Plant dwarf (in the North American sense), a bush squash adapted to

237. ATTRACTIVE PISTILLATE FLOWER, grown at Ithaca, of Joko redondo, nearly full size; note the expanded calyx-lobes. *Cucurbita moschata* var. *melonæformis*.

238. CUCURBITA MAXIMA var. TURGIDA, grown at Ithaca from Bolivian seeds. Leaf often measures 20–24 inches across.



239. MATURE FRUIT, dull green in color, of *Cucurbita maxima* var. *turgida*, from Bolivian seed. Note the cylindric peduncle, not expanded at attachment. × 1/5.

field culture along parallel ridged rows with tillage between, vines about 2 m. long: leaves ovate-reniform, only obscurely or very shallowly lobed: fruit flattened endwise, uniformly and not deeply many-furrowed, apical scar large.

C. maxima var. **Zapinka,** Millan, l.c. 341.

Dwarf plant bearing a small hard-shelled durable grayish often tubercled or rough pepo flattened endwise and only slightly if at all furrowed, cream-colored reticulate with green.

C. maxima var. **triloba,** Millan, l.c. 342.

Dwarf with large leaves: pepo 3-lobed and 3-loculed, dull green and rugose, about 24 cm. diameter at middle, peduncle long, angled, somewhat thickened but not expanded at attachment.

In the Russian treatments of cultivated Cucurbitas (Bull. Applied Bot. xxiii, 182, 1929–30), geographical botanical names are given by Zhiteneva to the ranges of *C. maxima* as vars. *peruviana, boliviana, chiloensis, abyssinica, asiatica,* as well as of *C. moschata* vars. *mexicana, indica, turkestanica, japonica, columbica.* Similar geographic names have been applied to *C. Pepo* as var. *gilensis,* Carter (Amer. Anthrop. xlviii, 17, 1946), "name suggested for the squash domesticated in Northwest Mexico"; also var. *americana* and var. *turcica,* Zhiteneva, l.c.

Cucurbita mixta, Pangalo, in Bull. Applied Bot., Leningrad, xxiii, 258, 264 in the English text, mentioned elsewhere in the Russian text (1929–30).

Annual herb with long pubescent branches "not coarsely thorned": leaves cordate, lobed not more than half way into 5 rhombical or triangular lobes; calyx cup-shaped with awl-shaped sepals; corolla bell-shaped with 5 sharp petals bent outwards; column of stamens longer than filaments: fruit "of a different shape and size," with a thick or a thin cylindrical, conical or angled fruit-stalk, the skin or shell woody, of a white or seldom yellow color with ten green or yellow reticulated stripes; seeds often long, white with a rugged surface, and edge of dirty or bluish tinge.

The above account is drawn from the English version in Pangalo, and one is not clear to contrast *C. mixta* with the other cultivated species. Pangalo states that hybridization experiments with *C. moschata, C. Pepo, C. maxima* "have proved to be of little success, very few fruits forming, often with a low or even zero of normal seeds." He states also that the species "has no agronomic significance—that is why it has not spread beyond its center of origin, but has remained only in Mexico and Guatemala."

His pictures of foliage, flower, and fruits disclose forms that are now referred to one or another of the three well-known species.

Pangalo divides the species into two varieties: *C. mixta* var. *stenosperma* with thick cylindric or conical peduncle, dissected leaf-blade, large flowers, yellow pepo, white very narrow and long seeds; cultivated in Mexico; var. *cyanoperizona* with a thin 5-angled peduncle widening at attachment to the fruit, leaf-blade less dissected, smaller flowers, pepo white, seeds large, broad, edged by a blue border; cultivated in Guatemala; this plant suggests *C. argyrosperma* (see page 457).